

sideration has both valves “as distinctly and regularly perforated as those of any *Terebratulidæ*.” Either Dr. Carpenter or I must be labouring under some serious mistake. If the mistake be mine, I shall readily bow to correction; but I may be excused maintaining my view until the appearances on which it is founded are shown to support a contrary conclusion.

Belmont, near Galway, July 14, 1865.

PROCEEDINGS OF LEARNED SOCIETIES.

ROYAL SOCIETY.

June 15, 1865.—Major-General Sabine, President, in the Chair.

“A Description of some Fossil Plants, showing Structure, found in the Lower Coal-seams of Lancashire and Yorkshire.” By E. W. Binney, F.R.S.

The author stated that, although great attention has been devoted to the collection of the fossil remains of plants with which our coal-fields abound, the specimens are generally in very fragmentary and distorted conditions as they occur imbedded in the rocks in which they are entombed; but when they have been removed, cut into shape, and trimmed, and are seen in cabinets, they are in a far worse condition. This is as to their external forms and characters. When we come to examine their internal structure, and ascertain their true nature, we find still greater difficulties, from the rarity of specimens displaying both the external form and the internal structure of the original plant. It is often very difficult to decide which is the outside, different parts of the stem dividing and exposing varied surfaces which have been described as distinct genera of plants.

The specimens described were collected by the author himself, and taken out of the seams of coal, just as they occurred in the matrix in which they were found imbedded, by his own hands. This has enabled him to speak with certainty as to the condition and locality in which they were met with.

By the ingenuity of the late Mr. Nicol of Edinburgh, we were furnished with a beautiful method of slicing specimens of fossil wood so as to examine their internal structure. The late Mr. Witham, assisted by Mr. Nicol, first applied this successfully, and his work on the internal structure of fossil vegetables was published in 1833. In describing his specimens, he notices one which he designated *Anabathra pulcherrima*. This did not do much more than afford evidence of the internal vascular cylinder arranged in radiating series, somewhat similar to that described by Messrs. Lindley and Hutton as occurring in *Stigmaria ficoides*, in the third volume of the ‘Fossil Flora.’

In 1839 M. Adolphe Brongniart published his truly valuable memoir, “Observations sur la structure intérieure du *Sigillaria ele-*

gans comparée à celle des *Lepidodendron* et des *Stigmaria* et à celle des végétaux vivants," in the Archives du Muséum d'Histoire Naturelle. His specimen of *Sigillaria elegans* was in very perfect preservation, and showed its external characters and internal structure in every portion except the pith and a broad part of the plant intervening betwixt the internal and external radiating cylinders. Up to this time nothing had been seen at all to be compared to M. Brongniart's specimen, and no person could have been better selected to describe and illustrate it. His memoir will always be considered one of the most valuable ever contributed on the fossil flora of the Carboniferous period.

In 1849, August Joseph Corda published his 'Beiträge zur Flora der Vorwelt,' a work of great labour and research. Amongst his numerous specimens, he describes and illustrates one of *Diploxyylon cycadeoideum*, which, although not to be compared to M. Brongniart's specimen, still affords us valuable information; confirming some of that author's views rather than affording much more original information. All these last three specimens M. Brongniart, in his 'Tableau de végétaux fossiles considérés sous le point de vue de leur classification botanique et de leur distribution géologique' (published in 1847), classes as *Dicotylédones gymnospermes*, under the family of *Sigillarées*—amongst other plants his *Sigillaria elegans*, Mr. Witham's *Anabathra*, and Corda's *Diploxyylon*.

In 1862 the author published, in the 'Quarterly Journal of the Geological Society' of that year, an account of specimens which confirmed the views of the three learned authors above named as to *Sigillaria* and *Diploxyylon* being allied plants; but showed that their supposed pith or central axis was not composed of cellular tissue, but of different-sized vessels arranged without order, having their sides barred by transverse striæ like the internal vascular cylinders of *Sigillaria* and *Lepidodendron*. These specimens were in very perfect preservation, and showed the external as well as the internal characters of the plants.

All the above specimens were of comparatively small size, with the exception of that described by M. Corda, which, although it showed the external characters in a decorticated state, did not exhibit any outward resemblance to a plant allied to *Sigillaria* with large ribs and deep furrows so commonly met with in our coal-fields, but rather to plants allied to *Sigillaria elegans* and *Lepidodendron*.

In the present communication the author has described some specimens of larger size than those previously alluded to, and endeavoured to show that the *Sigillaria vascularis* with rhomboidal scars gradually passes as it grows older into a ribbed and furrowed *Sigillaria*, and that this singular plant not only possesses two woody cylinders arranged in radiating series, an internal and an external one divided by a zone of cellular tissue, both increasing on their outsides at the same time, but likewise has a central axis composed of hexagonal vessels, arranged without order, having all their sides marked with transverse striæ. Evidence is also adduced to show that *Sigillaria* dichotomizes in its branches something like *Lepidodendron*, and that,

like the latter plant, it has a *Lepidostrobus* for its fructification. The outer cylinder in large *Sigillariæ* is composed of thick-walled quadrangular tubes or utricles arranged in radiating series, and exhibiting every appearance of the tree having been as hard-wooded as *Pinites*, but as yet no disks or striæ have been observed on the walls of the tubes. *Stigmara* is now so generally considered to be the root of *Sigillaria*, that it is scarcely necessary to bring any further proof of this proposition; but specimens are described which prove by similarity of structure that the former is the root of the latter.

The chief specimens described in the memoir are eight in number, and were found in the lower divisions of the Lancashire and Yorkshire coal-measures, imbedded in calcareous nodules occurring in seams of coal.

No. 1, *Diploxyton cycadoideum*, was from the first-named district, and the same locality as the *Trigonocarpon*, described by Dr. J. D. Hooker, F.R.S., and the author, in a memoir on the structure of certain limestone nodules enclosed in seams of bituminous coal, with a description of some *Trigonocarpons* contained therein*; and the other seven (*Sigillaria vascularis*) were from the same seam of coal in the lower coal-measures in which the specimens described in a paper entitled "On some Fossil Plants showing Structure from the Lower Coal-measures of Lancashire" †, were met with, but from a different locality in Yorkshire.

"On the Fossil Mammals of Australia.—Part II. Description of an almost entire Skull of *Thylacoleo carnifex*, Ow." By Professor Owen, F.R.S. &c.

In this Part the author gives additional cranial and dental characters of the extinct marsupial carnivore, *Thylacoleo*, deduced from examination of better-preserved fossils, obtained from freshwater deposits in Darling Downs, Queensland, Australia.

The fore part of the skull, wanting in the first-described specimen from similar deposits in the province of Victoria, is preserved in the present specimen, showing the premaxillary bones, which are relatively larger than in placental felines. Each bone has three teeth, of which the foremost is developed into a tusk, the second and third being very small. There is no canine, or no tooth developed as a laniary in the maxillary bone. In the short extent of the alveolar border of this bone between the great carnassial molar and the maxillo-premaxillary suture, there are two approximate small round sockets, which lodged either one double-rooted tooth or two small single-rooted teeth. But dental development has mainly expended itself upon the perfection of a pair of laniary incisor tusks, in both upper and lower jaws, for piercing, tearing, and holding, and a pair of carnassials in both jaws for flesh-cutting. These, in the present specimen, closely agreed with those described in the former one, but were more worn: they are the largest examples of these

* Philosophical Transactions, 1855, p. 149.

† Quarterly Journal of the Geological Society of London for May 1862.

peculiarly modified shear-blade teeth in the mammalian class. Although the tusks are incisors—not, as in placental carnivora, canines—they possess, through the singular shortness of the facial part of the skull in *Thylacoleo*, the same mechanical advantage, in their proximity to the biting-power of the enormously developed temporal muscles, as in *Felis*. In the lower jaw there is, anterior to the carnassial, either a socket for a small double-rooted premolar, or two approximate sockets for as many single-rooted ones; and, as in the upper jaw, these cavities do not range in the same longitudinal line with the carnassial, but extend obliquely inward and forward, from the inner side of its fore part. There is no other alveolus in the lower jaw between the premolar one and that of the large lower tusk. The small ‘tubercular’ molar on the inner side of the hind end of the upper carnassial, and the two ‘tuberculars’ behind the lower carnassial, are indicated by their sockets in the present specimen. The author sums up, from acquired data, the dental formula of *Thylacoleo* as follows:—Incisors $\frac{3-3}{1-1}$, Canines $\frac{?}{?}$, Premolars $\frac{1-1}{1-1}$ or $\frac{2-2}{2-2}$, Carnassials $\frac{1-1}{1-1}$, Tuberculars $\frac{1-1}{2-2}$. Of the incisors, the foremost above are long and large tusks, like the pair below: of the other teeth, the carnassials, of unusually large size, are functioned as flesh-cutters, and the small tuberculars would serve for pounding gristle or tendon, as in *Felis*: the premolars indicated by sockets, and the small upper incisors, represent a remnant of the dental family type under its extreme adaptive modifications in *Thylacoleo*.

In the rest of the skull of the subject of the present Part, many particulars are yielded in addition to those deduced from the fragmentary fossils which indicate the genus. They confirm the deductions of the marsupial nature of the large extinct Australian carnivore, determine the alternative expressed in the author’s first communication as to the homologies of the inferior tusks, and show that the genus *Thylacoleo* ranges, not with the series now including *Didelphys*, *Dasyurus*, and *Thylacynus*, but with the Diprotodont group, more eminently characteristic of the Australian continent, and which is at present represented by, or reduced to, the genera *Phascolarctos*, *Phalangista* with its subgenera, *Macropus* with its subgenera, and *Phascolomys*. The carnassial of *Thylacoleo*, in its large proportional size, absence of the tubercular part, and indications of subvertical groovings of the enamel, most closely resembles that tooth of the more ancient marsupial carnivore *Plagiaulax*, and is associated, in the lower jaw, as in that genus, with two small posterior tuberculars, one or two small premolars, and one large incisive tusk, similarly directed obliquely upward and forward. Few facts in mammalian palæontology are more interesting and suggestive than the occurrence in our hemisphere, during secondary geological periods, of Marsupial forms, which find their nearest representatives in existing or tertiary extinct *Marsupialia* of the continent of our Antipodes.

The present Part of the author’s series of Papers on Extinct Australian Mammals is illustrated with drawings of the entire skull of the *Thylacoleo carnifex*.